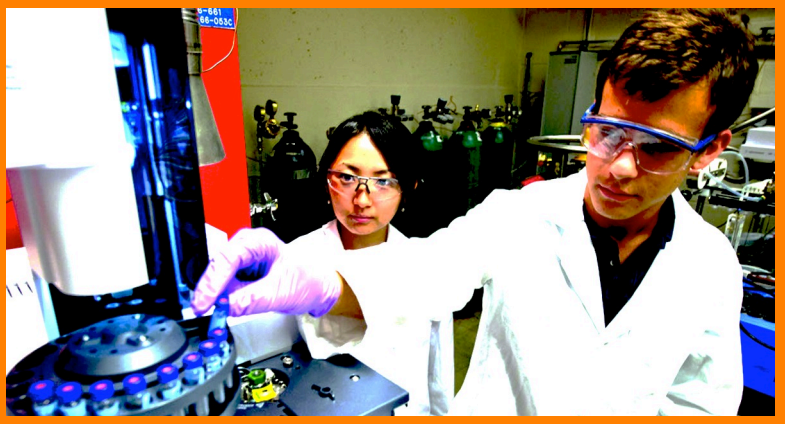
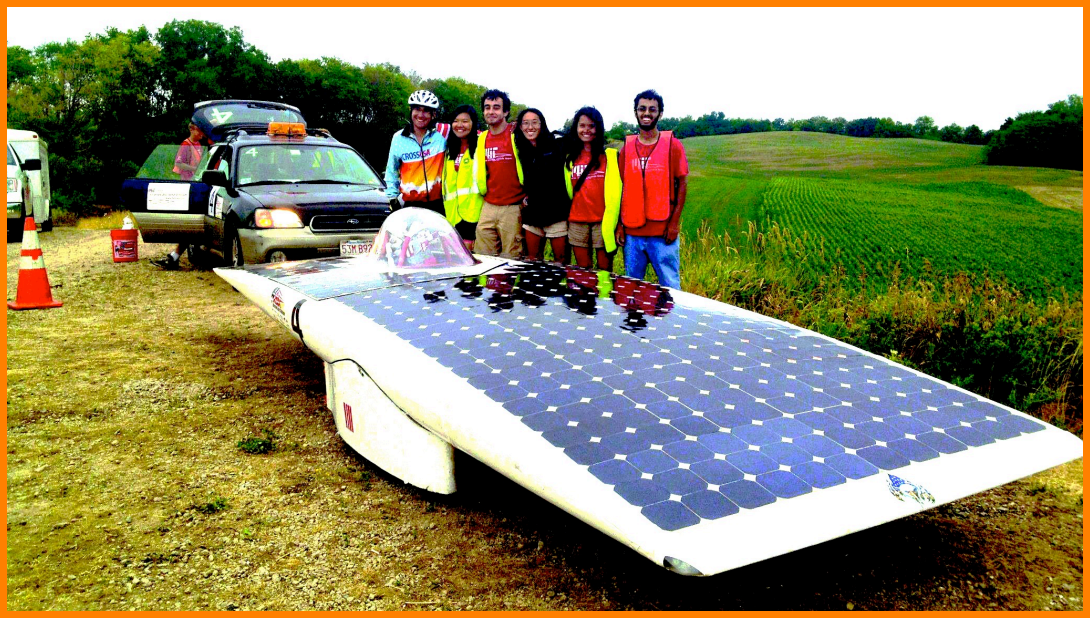
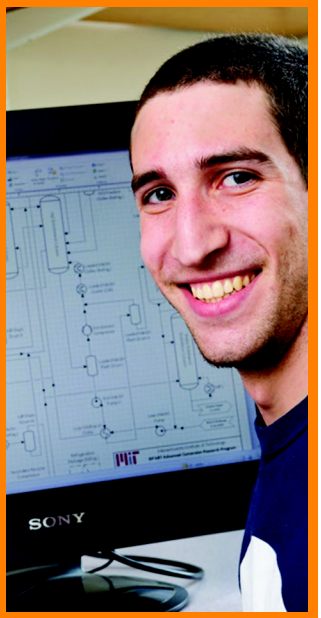
2012 SUMMER UROPs

STUDENT PROJECT DESCRIPTIONS







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MITei

Funding for MITEI UROPs in summer 2012 was provided by individual donors and by members of the MIT Energy Initiative, including inaugural Founding Member BP, Founding Member Shell, and individual Affiliate Members with a particular interest in supporting undergraduate research (http://mitei.mit.edu/about/members).

MITEI works with the MIT Undergraduate Research Opportunities Program (UROP) to support the participation of undergraduates in energy research and to encourage undergraduate interest in the energy field. MITEI UROPs can be conducted in any academic department or interdisciplinary laboratory.

The **MIT Energy Initiative** (MITEI) was formally launched by President Susan Hockfield in November 2006 to mobilize the capabilities and experience of the Institute to "foster new research in science and technology to increase energy supplies ... bringing scientists, engineers and social scientists together to envision the best energy policies for the future." MITEI is now a broad, Institute-wide initiative designed both to transform the global energy system to meet the needs of the future and to help build a bridge to that future by improving today's energy systems.

In 2012, MITEI has grown to:

- Nearly 70 private and public members
- More than $300M in research and education support
- 101 novel or early stage research projects

The undergraduate **Energy Studies Minor,** MIT's first interdisciplinary minor, was launched in September 2009.

Student: Abdullah Alsaeed	**Chemical Engineering**
Faculty: Bradley Olsen	Chemical Engineering
Sponsor: Volunteer	
Project: Protein nanopatterning templated by self-assembled block copolymers in thin films	
Enzymes have shown a great potential for catalyzing reactions outside of living bodies. They can be used in many applications such as energy, biosensors and many others. However, one limiting factor is the stability of these enzymes in vitro. To solve this issue, block copolymers can be used to stabilize and immobilize the enzyme for increasing activity. However, a major problem facing such complexes is the diffusion of the reactants through this matrix. We are developing a model to explain this diffusion, taking into account other factors such as the availability of the active site and interface equilibrium. Also, we are experimenting with such systems using a sample enzyme, organophosphate hydrolase.	

Student: Cecilio Aponte	**Materials Science & Engineering**
Faculty: Amy Glasmeier	Urban Studies and Planning
Sponsor: BP	
Project: Curriculum development for geospatial energy class	
I am working with Amy Glasmeier on the development of a new class on economic geography; I'm working with another UROP student, Dylan Joss. The class title is "Geography of the Global Economy: Energy, Resources, Conflict and Governance" and its purpose is to allow students to understand the strong link between the areas mentioned in the class title from a geographic perspective. Our role is doing background research, collecting class materials and testing out or formulating ideas for the class. I particularly focus on renewable energies and resources, since that is the field I'm interested in and want to further study. This class, being proposed for the energy minor, would allow students, even those from an engineering background, to understand the impact of their work and to analyze policy decisions on a global scale.	

Student: Eben Bitonte	Mathematics
Faculty: Christopher Knittel	**Management**
Sponsor: BP	
Project: The response of commercial aviation to fuel price shocks	
Alongside oil prices and the average global temperature, the talk about clean, renewable energy sources is on the rise worldwide. Everyone is looking for the "next big thing" in energy, be it wind power, solar power, or nuclear power, among others. But, economic barriers stand in the way of these potential solutions. Governments and firms have little reason to change their ways. I was drawn to the field of energy economics with these dilemmas already on hand around the globe. Yet, after talking to Professor Christopher Knittel, I realized that we still do not even fully understand how we currently operate economically, let alone how we could operate under one of these new solutions. The value gained by the study of industries' and companies' reaction to a world where oil demand growth continues to threaten supplies can lead to efficiencies that may not have previously appeared. Through the study of energy economics this summer, I look to learn not only about how basic economic research is conducted, analyzed, and presented, but also look to make breakthroughs that could potentially help the world function more efficiently today.	

Student: Linh Bui	Chemical Engineering
Faculty: Yuriy Roman	**Chemical Engineering**
Sponsor: Friends of MITEI	
Project: Synthesis of SSZ-13 and SAPO-34 nanosheets	
In Prof. Roman's research group, we are studying zeolite nanosheets, a novel type of zeolite with potentially extraordinary properties over traditional zeolites. Zeolites are of particular interest to the petrol industry because they are capable of size and shape-selective catalysis due to strong acid sites in the microporous crystalline framework. At the same time, the microporous nature of the material limits application to small molecules that can diffuse through the pores. One way to overcome this limitation is to create nanosheets of the desired zeolites (ideally with a thickness of a single crystal cell) to maximize molecular diffusion. Within the summer project, we hope to synthesize, characterize, and find test reactions to showcase the utility of these organic-inorganic hybrid materials. I am excited about this project because not only am I learning how to synthesize these important catalysts, but also because this work will dramatically improve their efficiency and consequently their usefulness in industry.	

Student: Jose Burgos	Materials Science & Engineering
Faculty: Ronald Ballinger	**Nuclear Science & Engineering**
Sponsor: A. Thomas Guertin PhD '60	
Project: Mechanical properties characterization of a functionally graded composite for the generation IV Pb-Bi cooled fast reactor	
During the summer, I plan on continuing the development process by characterizing the mechanical properties of the structural layer/corrosion resistant layer interface for a Generation IV Pb-Bi Cooled Fast Reactor. As a freshman my knowledge of the research area was, and still is, fairly limited. By participating in this UROP, I feel that the new skills and experiences that I gain will help reassure me that materials science and engineering is right for me as I plan to declare my major later this spring. I am excited about the fact that I will be able to see the practical applications of materials science in combination with nuclear science and engineering towards the goal of more efficient energy, while knowing that the work that I do has the potential to advance the future of nuclear reactors and impact millions of people who would use its power. I hope to learn how to use materials science outside the classroom and get a sense of what it is like in research and development as well as industry while gaining some necessary experience that will carry into my future professional career.	

Student: Khetpakorn Chakarawet	Chemistry
Faculty: Christopher Cummins	**Chemical Engineering**
Sponsor: Jerome I. Elkind '51, ScD '56	
Project: Catalysis of molybdenum metaphosphate for solar water splitting	
Since metal phosphates are shown to be potential candidates in catalytic water splitting processes, the chemistry of cobalt cyclotrimetaphosphate and cobalt cyclotetrametaphosphate were studied by Montag et al. The utilization of cyclometaphosphate ligands is carried on to the current project. This project focuses on earth-abundant metal molybdenum because of its known applications in oxidation catalysis, making it a potential alternative to precious metals such as platinum previously used as catalyst. In this project, derivatives of molybdenum cyclometaphosphates, stemming from the discovery of [Mo(P3O9)(CO)3]3- by Clough et al, will be a subject of study for the possibility of a water splitting catalyst. The catalysis of molybdenum metaphosphate has never been investigated before, and therefore a fertile ground of molybdenum metaphosphate science is waiting to be discovered.	

Student: Priyanka Chatterjee	Mechanical Engineering
Faculty: Michael Triantafyllou	**Mechanical Engineering**
Sponsor: BP	
Project: Designing a small-scale, efficient wave power system for electricity generation	
I propose to research and design a small-scale, efficient wave turbine system under the supervision of Mechanical and Ocean Engineering Professor Michael S. Triantafyllou. The small-scale system shall be mounted on the MIT-Singapore kayak and used to produce enough energy to power a sensor strip that connects to the research and testing equipment of ongoing projects on the kayak. The overarching aim of this project is to evaluate the potential of wave power systems for sea craft and for deployment on littoral zone regions that encounter constant tidal and wave patterns.	

Student: Anthony Concepcion	Chemical Engineering
Faculty: William Green	**Chemical Engineering**
Sponsor: William Chao '78	
Project: Desulfurization of crude oil by supercritical water	
Conventional methods of creating clean fuels use energy-inefficient methods to remove sulfur-containing contaminants. We are exploring a completely different approach, based on new (and so far poorly understood) chemistry occurring in supercritical water(no need for a paragraph return here… but it wouldn't let me remove it!) The project studies the mechanism of supercritical water desulfurization of model organic compound mixtures. I will operate a batch reactor and/or a CSTR to treat various mixtures with supercritical water and analyze the gas and liquid product. The analysis will be done with various gas chromatography methods and an x-ray detector.	

Student: Michelle Dutt	Civil & Environmental Engineering
Faculty: Ruben Juanes	**Civil & Environmental Engineering**
Sponsor: Friends of MITEI	
Project: Leakage of CO2 gravity currents through faults	
In this UROP project, we are going to study the major physical processes that control leakage of gravity currents through discrete fractures. We will conduct bench-scale experiments with analogue fluids and flow cells. Specifically, I will be involved in designing the experiments, manufacturing the flow cells, conducting the experiments, as well as analyzing the data.	

Student: Dan Eisenberg	Chemical Engineering
Faculty: Howard Herzog	**MIT Energy Initiative**
Sponsor: BP	
Project: BP-MIT Conversion research program - estimating capital costs for building gasification plant	
This summer I will be joining a process modeling team in Howard Herzog's Energy Initiative research laboratory within the "BP-MIT Conversion Research Program." The project teamis investigating different potential methods for the conversion of biomass into liquid fuels through gasification and the Fischer-Tropsch process. My role is to help the team develop estimates for the capital cost of building a chemical plant that would perform this process. I will be using Aspen Plus (advanced chemical process modeling software), Microsoft Visio, information from vendors of chemical-processing equipment, and publicly available data to build the economic model. Additionally, I will be organizing equipment lists, estimating the electrical and thermal load of the proposed plant, and helping the team draw simplified process and utility flow diagrams.	

Student: Aaron Fittery	Mechanical Engineering
Faculty: Harry Asada	**Mechanical Engineering**
Sponsor: BP	
Project: Design of highly maneuverable robots for nuclear power plant inspection	
The chief purpose of this research project is to develop fully functional robots that can enter the piping systems and send images back of critical components. Underwater robotics is an advanced field already, but the highly confined spaces and presence of numbers sensors and obstacles present some unique challenges. The research project has focused on using jet propulsion. The maneuvering jets are controlled by high speed valves that can very efficiently redirect the jets at high speed. The newest design has involved combining this jet propulsion with highly efficient propellers. The jets are used for maneuvering and fine control, while the propeller is used to travel long distances efficiently.	

Student: Ryan Friedrich	Chemical Engineering
Faculty: Michael Strano	**Chemical Engineering**
Sponsor: BP	
Project: A hyperstable chloroplast biofuel cell enabled by nanotechnology	
This UROP will be exploring the transition from chloroplast photosynthesis to biomimicry in solar cells. In particular, it will incorporate nanomaterials and naturally occurring molecules into encapsulated chloroplasts to promote self-repair and indefinite photoactivity. It will also attempt to increase photosynthetic efficiency by using concentrated antennas and reaction centers in chloroplast. The end result will be a more efficient solar cell.	

Student: Julia Hsu	Mechanical Engineering
Faculty: Anette Hosoi	**Mechanical Engineering**
Sponsor: Shell	
Project: Preparing and improving MIT Solar Electric Vehicle Team's solar car for future solar car designs	
The goal of this project is to improve, test, and race the MIT Solar Electric Vehicle Team's Chopper del Sol in the American Solar Challenge and to use this experience to start designing for the next solar car. The project will focus primarily on the mechanical area of the car including the braking system and its smaller aspects such as the parking brake. The general braking system performs well, but I will seek solutions to a lighter and even more efficient braking system to increase the solar car's efficiency. In addition, the parking brake must be modified and adjusted for the solar car.	

Student: Dylan Joss	Undeclared
Faculty: Amy Glasmeier	**Department of Urban Studies and Planning**
Sponsor: Shell	
Project: Curriculum Development for geospatial energy class	
Professor Amy Glasmeier, Head of MIT Dept. of Urban Studies and Planning; Cecilio Aponte, MIT undergraduate; and I are working to develop the underlying materials for a new class in the energy minor. The goal of the class is to introduce students to the basic principles of economic geography and to give them the tools to understand how and why resource distribution begets conflict and legislation. Specifically, Cecilio and I are helping Prof. Glasmeier map out the 13 weeks of the course, as well as view and select supplemental instruction (readings, films, and other media). The two of us hope to provide valuable feedback from a student's perspective as the course is created: what method of instruction we think would be best in a given scenario, what readings we feel are helpful or superfluous, etc. Currently, I am working to understand the economics behind resource maintenance, extraction, distribution, and consumption.	

Student: Katie Lee	Chemical Engineering
Faculty: Michael Strano	**Chemical Engineering**
Sponsor: Albachiara Rinnovabili S.r.I.	
Project: Graphene and single-walled carbon nanotube growth for photovoltaic applications	
During my UROP, I will be optimizing graphene quality, growing aligned single-walled carbon nanotubes (SWNT), and investigating the quality of the SWNT/graphene junctions through photoconducting atomic force microscopy. The goal of this UROP is to study the photovoltaic behavior of these junctions to build a solar cell that has the potential to store more energy through this interaction between the energy bands and excitons.	

Student: Kyumin Lee	Chemical Engineering
Faculty: Jean-Francois Hamel	**Chemical Engineering**
Sponsor: BP	
Project: Sorghum hydrolysis and ethanol production	
Sorghum is a drought-tolerant crop rich in starch that grows readily in many environments. In addition, it is not as widely consumed as a staple as other plants such as corn and cassava. As a result, sorghum is a very attractive source of starch for ethanol production. The ethanol production process from sorghum is still not well optimized, and Professor Hamel's laboratory has been working on studying this process. I will be working especially closely with graduate student Jordi Kucharski this summer. My major is Course X-B (Chemical-Biological Engineering), and one of the areas of research in this field that I am most interested in is biofuel research. As the need for alternatives for fossil fuels grows, I believe that the development of a viable means of synthesizing biofuels will become increasingly vital. I believe that this UROP position will be a good opportunity for me to see what conducting research in this field is really like.	

Student: Dillon McConnon	Mechanical Engineering
Faculty: Steve Banzaert	**Mechanical Engineering**
Sponsor: Natalie M. Givans '84	
Project: Racing in the American Solar Challenge	
My goal for this UROP is to understand the basic concepts behind building and racing small, light-weight vehicles. Along with that, I plan to get more comfortable working in a collaborative environment of my peers and to understand how to manage time to meet hard deadlines. I also hope to gain a greater understanding of the software used to model manufactured parts, such as SolidWorks, and I hope to better understand how to model the energy of a system and how to use the model to optimize energy usage.	

Student: Yukino Nagai	Chemical Engineering
Faculty: Paul Barton	**Chemical Engineering**
Sponsor: BP	
Project: Optimizing ethanol productivity using dynamic flux balance analysis	
Over the summer, I will be working alongside Dr. Kai Hoeffner, a postdoc in the Process Systems Engineering Laboratory (PSEL). My task will be to model the metabolism of two other microorganisms, Desulfovibrio vulgaris and Methanococcus maripaludis, based on a paper by Sergey Stolyar et al. of the University of Washington. This project uses a method called dynamic flux balance analysis to model processes. Flux balance analysis allows a process to be simulated on a computer, which is far more efficient than physically running a process with its various parameters. Because there are two species involved, the model needs to be dynamic, to account for the interaction between the two species. The goal of this project is to find the optimal parameters for maximal production of ethanol.	

Student: Sarandeth Reth	Electrical Engineering & Computer Science
Faculty: Michael Greenstone	**Economics**
Sponsor: William Chao '78	
Project: The impact of natural gas drilling on local health and economic outcomes	
As drilling operations spread throughout the country, public debate surrounding the environmental implications of natural gas production has intensified, and hydraulic fracturing has been a target of particular concern. Scientists and public health advocates have raised questions of how fracking might contaminate the air, soil, or even drinking water in areas adjacent to drilling operations. Working directly with Professor Greenstone's team, I will be responsible for building and maintaining a one-of-a-kind dataset of hydraulic fracturing and natural gas drilling operations in the United States. I will also assist the team with data cleaning and preliminary data analysis.	

Student: Jean Sack	Mechanical Engineering
Faculty: Evelyn Wang	**Mechanical Engineering**
Sponsor: BP	
Project: Improving efficiency of solar thermophotovoltaics	
For this UROP, I will be working with Andrej Lenert and Nenad Miljkovic under Professor Wang on improving efficiency of solar thermophotovoltaics (STPVs). The main focus of the project is designing and improving selective absorbers to accept a larger solar spectrum. The other aspect of the project is removing excess heat through encouraging dropwise instead of film condensation. Experimentation with surface finish and materials will be done to determine the best combination for most effective cooling.	

Student: Alexander Siegenfeld	Chemistry
Faculty: Daniel Nocera	**Chemistry**
Sponsor: George R. Thompson, Jr. '53	
Project: Synthesis and study of novel water oxidation catalysts	
The most basic goal of this project is to synthesize and analyze new compounds that have the ability to oxidize water to oxygen gas. The analysis of these compounds will enable us to better understand how transition metals catalyze water oxidation and to determine how catalytic activity and electrochemical properties are affected by the choice of the transition metal center of the corroles and how such properties are related to the electronic structures of the catalysts. Determining how modification to the "hangman" xanthene backbone affects catalytic activity is another goal. Hopefully, this project will provide insight into both how to create better water oxidation catalysts and also how to tune current catalysts for maximum performance.	

Student: Scott Skirlo	Physics
Faculty: Michael Demkowicz	**Materials Science and Engineering**
Sponsor: BP	
Project: Investigating elastic properties of heterophase interfaces	
The goal of this project is to use atomistic modeling methods to develop models of the elastic properties of heterophase interfaces. When a composite material contains a high volume fraction of interfaces, its elastic properties depend both on the intrinsic elastic properties of its constituents as well as the elastic properties of the interfaces between them. The latter in turn depend on the type interface present. This work has the potential to impact design of thermoelectric materials.	

Student: Sean Tang	Architecture
Faculty: Sheila Kennedy	**Architecture**
Sponsor: George R. Thompson, Jr. '53	
Project: The SOFT House Project: continued development of smart, dynamic, energy harvesting curtains	
My UROP with Professor Sheila Kennedy will focus on continuing her research of smart, solar curtains within Professor Kennedy's on-going SOFT HOUSE project. The research will focus on the design of smart curtains that use DC clean energy from PV system to power solid state lighting with efficient low voltage, the study of micro-climates created by configurations of curtains in conjunction with radiant floors and the development of graphic design and design interfaces for the smart curtain system.	

Student: Arvind Thiagarajan	Biological Engineering and Physics
Faculty: Timothy Lu	**Electrical Engineering & Computer Science**
Sponsor: Shell	
Project: BioBatts: Intercepting bacterial respiration to convert sugar efficiently to electricity	
The work for this summer UROP can roughly be broken down into three subproblems, namely optimizing the bacterial cell, optimizing the quantum dot, and optimizing the interaction between quantum dot and semiconductor electrode. This research and its extension into the subsequent school year are intended to culminate in the production of a cheap, long lasting battery. We have calculated that a AA- sized battery, powered by this technology, would have at least twice the energy density of a lithium ion battery, six times the lifetime of a AA battery, and could be sold at profit for half the cost of a AA battery.	

Student: Sterling Watson	Mechanical Engineering
Faculty: Gang Chen	**Mechanical Engineering**
Sponsor: New York State Energy Research and Development Authority	
Project: Designing a test rig for characterizing thin-film photovoltaics	
The NanoEngineering group in the Mechanical Engineering Department is developing a light-trapping technique to enable thin-film crystalline silicon solar cells to reach efficiencies that are competitive with conventional bulk silicon photovoltaics. I will begin my project with an in-depth independent study on the operation, fabrication, and characterization of photovoltaics. Given that solar electricity is not yet grid-competitive in most electricity markets in the world, the cost reductions associated with reducing material mass in silicon solar cells is needed to allow thin-film silicon solar cells to become a competitive electricity source, enabling an economically feasible transition from conventional fuels toward clean, renewable energy.	

Student: Spencer Wenck	Chemical Engineering
Faculty: Kristala Prather	**Chemical Engineering**
Sponsor: Shell	
Project: Metabolic engineering of e. coli for biofuels	
Over the summer, I will be working in the Prather Lab to metabolically engineer E. coli to produce many products. Although all of these products may have potential uses, they are also intermediaries in the process of producing isohexanol. Ideally we hope to create a process where isohexanol is created by glucose alone. The significance of this project is twofold: it could produce bacteria that can synthesize viable amounts of isohexanol, and it will increase my understanding and interest in biofuels, sustainable production, as well as techniques for working with bacteria.	

Student: Dennis Wilson	Electrical Engineering & Computer Science
Faculty: Una-May O'Reilly	**Computer Science and Artificial Intelligence Laboratory**
Sponsor: Shell	
Project: Wind farm turbine layout optimization	
The project I am working on is the optimization of wind turbine layout in wind farms. The U. S. is the home of the most and the largest on-shore wind farms, with the largest wind farm in the world being the Roscoe Wind Farm in Texas. While this farm boasts an impressive 627 turbines, the farm is continuously growing, and so the capacity of our algorithm must also be high. We would like an algorithm, or multiple algorithms, that interact with existing wind farm design tools, such as OpenWind, to maximize the power output of up to 1000 turbines.	

Student: Hannah Wood	Civil and Environmental Engineering
Faculty: Ruben Juanes	**Civil and Environmental Engineering**
Sponsor: BP	
Project: Calibration of a sonar lander to detect methane ebullition from lake sediments	
Methane is a gas that plays significant roles in energy and climate change. Methane is generated in many different ways, one being by organic-rich sediments located at the bottom of oceans, lakes, and other bodies of water. The goal of my UROP is to calibrate a sonar lander to detect methane ebullition in Upper Mystic Lake. The data gathered by the lander could inform us about which processes allow methane bubbles to collect into distinct pockets in the sediment, how long the accumulation pockets last, and how the ebullition is triggered by changes in hydrostatic pressure.	

Student: Rebecca Zhang	Electrical Engineering & Computer Science
Faculty: Vladimir Bulović	**Electrical Engineering & Computer Science**
Sponsor: Philip Rettger '80	
Project: Solar cell testing and quantum dots	
For my UROP I will be working in the ONE Lab directed by Professor Vladimir Bulovic. I will be fabricating quantum dot solar cells in the lab and testing them to see how certain characteristics affect the solar cells' performance. I will learn the techniques needed for building the devices like metal evaporating and spin coating. My project will be a subproject of one of the ONE Lab researchers) and the process of solar cell testing will hopefully teach me a lot about the current and future technology behind solar cells.	

2012 MITEI UROP Sponsors

MITEI Founding Member

In 2007, BP joined the MIT Energy Initiative as its inaugural Founding Member. In the summer of 2010, BP launched the inaugural Founding Member UROP program by supporting eleven BP-UROP students. BP-UROPs interact and share results with BP representatives both during and after the completion of their UROP.

Shell
MITEI Founding Member

Shell is a global group of energy and petrochemicals companies with around 101,000 employees in more than 90 countries and territories. In the U.S., we operate in 50 states and employ more than 20,000 people working to help tackle the challenges of the new energy future. We are a leading oil and gas producer in the deepwater Gulf of Mexico, a recognized pioneer in oil and gas exploration and production technology and one of America's leading oil and natural gas producers, gasoline and natural gas marketers and petrochemical manufacturers.

William Chao '78
Mr. Chao received his bachelor's degree from MIT in electrical engineering. He has made substantial accomplishments in the field of logic simulation for large - scale computing systems and digital IC designs, and is President of California - based Innovative Systems & Technologies. Mr. Chao is concerned about science and technology education, national energy policy and the capacity of US technology and engineering developments to meet rising energy demands in a fiscally, socially and environmentally responsible fashion.

Jerome l. '51 and Linda Elkind *MITEI Affiliate Member*
Jerry Elkind received his bachelor's and doctor's degrees in electrical engineering. His early career was devoted to computer research at BBN and Xerox. He is now working on computer technology to help people with learning disabilities, co - founding Kurzweil Educational Systems and the Lexia Institute. Linda received her bachelor's degree from Smith College. Her career focused on environmental education and environmental issues in land use. Both have been concerned for many years about environmental sustainability and energy efficiency.

Natalie M. Givans '84 *MITEI Affiliate Member*
Natalie received her bachelor's degree from MIT and master's degree from Johns Hopkins, both in electrical engineering. She is currently the Vice President of Booz Allen Hamilton, a leading strategy and technology consulting firm that is based in Herndon, VA. She leads the firm's Assurance & Resilience team, which delivers Information Assurance and IT Security capabilities and service offerings into the firm's U.S. government and commercial Cyber markets.

2012 MITEI UROP Sponsors (cont'd)

Dr. Alfred Thomas Guertin '60 *MITEI Affiliate Member*
Dr. Guertin received his PhD in Chemistry from MIT and worked at Geo Environmental Technologies—an environmental and geotechnical consulting firm. He now lives in Palm Coast, Florida.

NYSERDA *MITEI Affiliate Member*
NYSERDA is a public benefit corporation created in 1975 under Article 8, Title 9 of the State Public Authorities Law [PDF] through the reconstitution of the New York State Atomic and Space Development Authority. NYSERDA's earliest efforts focused solely on research and development with the goal of reducing the State's petroleum consumption. Today, NYSERDA's aim is to help New York meet its energy goals: reducing energy consumption, promoting the use of renewable energy sources, and protecting the environment.

Philip Rettger '80 *MITEI Affiliate Member*
Phillip Rettger has been active in a range of energy activities for more than 30 years, starting with MIT UROP assignments in energy conservation and renewable energy development at the Massachusetts Energy Office. Mr. Rettger subsequently worked in invention, commercialization, development and finance of projects that span solar PV, low-impact hydroelectric, biomass and waste fuel power generation, recycling, gasification, natural gas cogeneration, and unconventional oil recovery and processing. As a serial entrepreneur in the energy sector, Mr. Rettger was a co-founder of companies including OptiSolar, OPTI Canada, and Oxford Energy. Mr. Rettger also serves on the Board of Directors of the Mohegan Tribal Utility Authority.

Albachiara Rinnovabili S.r.l. *MITEI Affiliate Member*
Albachiara Rinnovabili is an Italian company, headquartered in Rome, active in the development, construction and running of renewable power plants. Its present focus is on utility-scale (i.e. 3 - 20 MWp power) distributed generation in the solar photovoltaic field. The company aims at achieving stringent quality objectives, as well as being on the forefront of technological efficiency. It implements its projects via its own resources as well as access to equity and credit markets, by leveraging on: (i) its proprietary scouting strategy, (ii) a solid expertise by its team in the financial, electrical engineering and environmental science fields.

George R. Thompson, Jr. '53 *MITEI Affiliate Member*
George Thompson, Jr. founded Commonwealth Scientific Corporation in 1968, a research and development company which deals in thin film and vacuum technology used in the semiconductor, magnetic head recording, thin film and optical coating industries. It sells to universities and government as well as commercial concerns. The company is now known as Ionbeam Scientific. Mr. Thompson received his Bachelor of Science from MIT in General Engineering.

Student	Project Title	Class Year	Student department	Sponsor	Faculty Supervisor
Abdullah Alsaeed	Protein nanopatterning templated by self-assembled block copolymers in thin films	2015	Chemical Engineering	Volunteer	Bradley Olsen
Cecilio Aponte	Curriculum development for geospatial energy class	2015	Materials Science & Engineering	BP	Amy Glasmeier
Eben Bitonte	The response of commercial aviation to fuel price shocks	2015	Mathematics	BP	Christopher Knittel
Linh Bui	Synthesis of SSZ-13 and SAPO-34 nanosheets	2013	Chemical Engineering	Friends of MITEI	Yuriy Roman
Jose Burgos	Mechanical properties characterization of a functionally graded composite for the generation IV Pb-Bi cooled fast reactor	2015	Materials Science & Engineering	Guertin	Ronald Ballinger
Khetpakorn Chakarawet	Catalysis of molybdenum metaphosphate for solar water splitting	2015	Chemistry	Elkind	Christopher Cummins
Priyanka Chatterjee	Designing a small-scale, efficient wave power system for electricity generation	2015	Mechanical Engineering	BP	Michael Triantafyllou
Anthony Concepcion	Desulfurization of crude oil by supercritical water	2015	Chemical Engineering	Chao	William Green
Michelle Dutt	Leakage of CO2 gravity currents through faults	2015	Civil & Environmental Engineering	Friends of MITEI	Ruben Juanes
Dan Eisenberg	BP-MIT Conversion research program - estimating capital costs for building gasification plant	2014	Chemical Engineering	BP	Howard Herzog
Aaron Fittery	Design of highly maneuverable robots for nuclear power plant inspection	2013	Mechanical Engineering	BP	Harry Asada
Ryan Friedrich	A hyperstable chloroplast biofuel cell enabled by nanotechnology	2014	Chemical Engineering	BP	Michael Strano
Julia Hsu	Solar Electric Vehicle Team	2014	Mechanical Engineering	Shell	Anette Hosoi
Dylan Joss	Curriculum development for geospatial energy class	2015	N/A	Shell	Amy Glasmeier
Katie Lee	Graphene and single-walled carbon nanotube growth for photovoltaic applications	2015	Chemical Engineering	Rinnovabili	Michael Strano
Kyumin Lee	Sorghum hydrolysis and ethanol production	2013	Chemical Engineering	BP	Jean-FrancoisHamel
Dillon McConnon	Solar Electric Vehicle Team	2015	Mechanical Engineering	Givans	Steve Banzaert
Yukino Nagai	Optimizing ethanol productivity using dynamic flux balance analysis	2015	Chemical Engineering	BP	Paul Barton
Sarandeth Reth	The impact of natural gas drilling on local health and economic outcomes	2015	Electrical Engineering & Computer Science	Chao	Michael Greenstone
Jean Sack	Improving efficiency of solar thermophotovoltaics	2013	Mechanical Engineering	BP	Evelyn Wang

Student	Project Title	Class Year	Student department	Sponsor	Faculty Supervisor
Alexander Siegenfeld	Synthesis and study of novel water oxidation catalysts	2015	Chemistry	Thompson	Daniel Nocera
Scott Skirlo	Investigating elastic properties of heterophase interfaces	2013	Physics	BP	Michael Demkowicz
Sean Tang	The SOFT House Project: continued development of smart, dynamic, energy harvesting curtains	2013	Architecture	Thompson	Sheila Kennedy
Arvind Thiagarajan	BioBatts: Intercepting bacterial respiration to convert sugar efficiently to electricity	2013	Biological Engineering and Physics	Shell	Timothy Lu
Sterling Watson	Designing a test rig for characterizing thin-film photovoltaics	2015	Mechanical Engineering	NYSERDA	Gang Chen
Spencer Wenck	Metabolic engineering of e. coli for biofuels	2015	Chemical Engineering	Shell	Kristala Prather
Dennis Wilson	Wind farm turbine layout optimization	2014	Electrical Engineering & Computer Science	Shell	Una-May O'Reilly
Hannah Wood	Calibration of a sonar lander to detect methane ebullition from lake sediments	2015	Civil & Environmental Engineering	BP	Ruben Juanes
Rebecca Zhang	Solar cell testing and quantum dots	2015	Electrical Engineering & Computer Science	Rettger	Vladimir Bulovic